WEST

Generate Collection Print

L7: Entry 25 of 54 File: USPT Jul 9, 1991

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TITLE: Powder-coated laundry detergent sheet

Brief Summary Text (9):
In attempting to incorporate a liquid detergent formulation into a nonwoven web substrate in an amount sufficient to wash a load of laundry, it has been discovered that the presence of certain detergent ingredients, namely the detergent enhancers, inhibit the incorporation of high levels of detergent solids with the meltblown web. For purposes herein, the "detergent enhancers" include water softening agents, anti-redeposition agents, and salts. For example, carboxymethyl cellulose, which is used as an anti-redeposition agent, causes the detergent composition to thicken, which makes homogeneous mixing more difficult. Also, sodium citrate and ethylenediaminetetraacetic acid (EDTA), which are used as water softening agents, cause phase separation of the liquid detergent and make uniform saturation of the meltblown web difficult. These disadvantages are overcome by separately adding the dry detergent formulation ingredients, including the detergent enhancers, to the surface of the sheet containing the liquid detergent formulation ingredients and adhering the dry ingredients to the sheet by taking advantage of any stickiness or tackiness which may be present due to the liquid ingredients. At the same time, the presence of the dry powder advantageously improves the feel of the sheet. As used herein, "powder" refers to dry granulated solids having an average particle size which is capable of passing through a twenty mesh screen and preferably is capable of passing through an eighty mesh screen.

Sieve Particle Size Analysis

One of the most common ways of measuring and specifying particle size of ceramic materials is by the use of sieves, often called meshes or screens.

How they work:

Particle sizes are separated industrially or in the laboratory by passing material over sieves that have opening of certain specified sizes. These sieves can range from extremely coarse devices that look like sewer grates for large size separations [range of inches] to sieves that look very much like window screens for middle separations [millimeter], to very fine woven screens for fine separations [~50 micrometers]. Separation can be either dry or wet. Wet screening is more efficient, but drying of the product adds cost.

What do the numbers mean?

Each sieve has a number, such as 20 mesh, 50 mesh, 200 mesh, 325 mesh. This number relates to the number of openings in the screen per inch, but the actual opening size is hard to estimate since the thickness of the wire varies (finer screens are made from finer wire). Modern practice is to refer to the screen by the size of the opening in microns.

Click here for a cross reference of screens and their opening dimensions==> sieves

Representing Screen analysis results

Screen results are represented in several ways, most commonly as weight percent of material passing [represented by a negative sign: -] or retained on [represented by a positive sign: +] a given screen. Thus, material specifications that indicate -30 mesh +80 mesh, call for a material with particles smaller than 30 mesh [590 μm] and larger than 80 mesh [177 μm]. The retained (+) and passing (-) nomenclature is also used in representing particle size analyses made with a series of screens. Consider the following table of results:

Screen number	Opening μm	Mass retained on screen, %
80	177	4
100	149	12
170	88	38
200	74	20
270	53	17
325	44	6
Pan		3

The third column gives directly the results of a laboratory screen analysis, i.e. the weights of the materials taken from each screen. The pan collects any material passing the final mesh and in this case represents material finer than 44 μm. However, these results are not so informative since we do not know the exact size of the material sitting on each screen. All we know about the 20% retained on the 200 mesh screen is that it is finer than 88 μm and coarser than 74μm.

A better way to present the data is by cumulative finer or cumulative coarser tables and graphs, as shown in the following table.

Screen number	Opening µm	Mass retained on screen, %	Cumulative % Finer than	Cumulative % Coarser than
80	177	4	96	4
100	149	12	84	16
170	88	38	46	54
200	74	20	26	74
270	53	17	9	91
325	44	6	3	97
Pan		3		

These finer than and coarser than data are unequivocal and precise. Exactly 26% of the material is finer than 74 µm and 74% is coarser.

Graphs illustrate the differences in nomenclature. Click to view each form of representation.

Histogram | CumPercentFiner | CumPercentCoarser